BY ORDER OF THE
INSTALLATION COMMANDER
KIRTLAND AIR FORCE BASE

KIRTLAND AIR FORCE BASE
INSTRUCTION 48-151

29 SEPTEMBER 2011

Aerospace Medicine

HEAT STRESS PROGRAM

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

ACCESSIBILITY: Publications and forms are available on the e-Publishing website at **www.e-Publishing.af.mil** for downloading or ordering.

RELEASABILITY: There are no releasability restrictions on this publication.

OPR: 377AMDS/SGPB

Certified by: 377AMDS/CC
(Lt Col Joseph Costantino)
Pages: 10

This instruction implements Air Force Policy Directive 48-1, *Aerospace Medical Program*, Air Force Pamphlet (AFPAM) 48 -151, *Thermal Injury*, and Air Force Manual (AFMAN) 10-100, *Airman's Manual*. It establishes Kirtland Air Force Base's (KAFB) responsibilities and procedures to prevent adverse effects of heat stress. This instruction establishes policies and rules for all personnel who are assigned to KAFB and perform non-flying (ground) duties during periods of hot weather. It does not apply to contractor personnel. It defines the Wet Bulb Globe Temperature (WBGT) Index, WBGT monitoring and reporting procedures, Heat Stress Index, Heat Stress posting, and unusual clothing stipulations. During mission-essential, contingency or emergency operations, commanders may waive the provisions of this instruction; however, when commanders waive procedures they must ensure all supervisors exercise caution, make certain all subordinate personnel are aware of heat injury symptoms and take actions to protect the health of their personnel. This publication applies to the Air National Guard (ANG) and Air Force Reserve Command (AFRC) Units. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the Air Force (AF) Form 847, *Recommendation for Change of Publication*; route AF Forms 847 from the field through the appropriate functional's chain of command. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with AFMAN33-363, *Management of Records*, and disposed of in accordance with Air Force Records Information Management System (AFRIMS) Air Force Records Disposition Schedule (RDS) located at: **https://www.my.af.mil/afrims/afrims/afrims/rims.cfm**. See Attachment 1 for Glossary of References and Supporting Information.

1. Responsibilities.

1.1. 377 Bioenvironmental Engineering (377 AMDS/SGPB) will:

1.1.1. Use the Wet Bulb Globe Temperature (WBGT) to measure the heat stress potential.

1.1.2. Bioenvironmental Engineering (BEE) may modify the frequency of monitoring based on local weather conditions (e.g., rain, overcast, drop in temperature), as required by AFPAM 48-151, paragraph 3.1.4.

1.1.3. Update the Heat Index document on "Kirtland General Announcement Bulletin Board."

1.1.4. E-mail approved alert message(s) to: **377abw.cp@kirtland.af.mil** , 377 Air Base Wing Command Post (377 ABW/CP), when any WBGT reading indicates a "Yellow Flag" or higher condition. Flag conditions are explained in Attachment 2.

1.2. 377 Public Health (377 AMDS/SGPM) will:

1.2.1. Provide thermal stress education and training on preventing and controlling heat-induced illness, when requested.

1.2.2. Track all thermal stress illnesses and the requirement for entry into the Air Force Safety Automated System.

1.3. 377 ABW/CP:

1.3.1. Upon receipt of an alert message from 377 AMDS/SGPB, initiate a base wide AtHOC notification.

1.4. 377 Air Base Wing Public Affairs (377 ABW/PA):

1.4.1. Upon receipt of heat stress alert messages, add to Kirtland ALL distribution.

1.5. Unit Fitness Leaders will:

1.5.1. Consider conducting physical training (PT) indoors when severe environmental conditions **exist. Refer to Air Force Instruction (AFI) 36-2905, *Fitness Program,* paragraph A3.4 "Prevention of Injury and Illness" for environmental conditions limiting PT activities.**

1.5.2. Retrieve the heat stress index from the "Kirtland General Announcement Bulletin Board" **https://kc4portal/sites/kirtlandafb/default.aspx**, prior to conducting PT.

1.6. Supervisors will:

1.6.1. Routinely retrieve the heat stress index from the Kirtland General Announcement Bulletin Board **https://kc4portal/sites/kirtlandafb/default.aspx**, and implement thermal stress safety procedures accordingly. Work center supervisors may have to adjust the work-rest cycles for operations that require heavy personal protective equipment.

1.6.2. Ensure employees working outside in hot environments increase their fluid intake, and implement appropriate work-rest cycles, reference Attachment 3.

1.6.3. Ensure all employees are trained to recognize thermal stress disorders and first aid treatment, reference Attachment 4.

1.6.4. Ensure employees are acclimatized in accordance with paragraph 3.

1.6.5. Report all thermal stress illnesses to 377 AMDS/SGPM at DSN 246-3461 or commercial (505) 846-3461.

1.7. Work center employees will:

1.7.1. Understand the signs and symptoms of thermal stress, and the associated first aid treatments.

1.7.2. Report all thermal stress illnesses to the work center's supervisor.

2. Monitoring Heat Stress.

2.1. BEE will routinely monitor heat stress index during the summer months. The summer monitoring period will begin 1 May and end 30 September. The summer monitoring period may be increased or decreased based on seasonal variations.

2.2. When the predicted or forecasted outside temperatures reach 85^0F as a daily high, BEE will perform heat stress monitoring at hourly intervals beginning at 1100hrs until 1400hrs or until the WBGT drops below a "Yellow Flag" condition, whichever is later.

2.3. The heat stress index is a tool to provide guidance to workplace supervisors in order to reduce heat stress injuries. An indoor measurement of the heat stress index should used instead of the outdoor measurement for hot indoor operations.

2.4. On weekends and non-duty hours, the Photovoltaic Systems Evaluation Laboratory at Sandia National Laboratories maintains a website with the WBGT when the ambient temperature is above 70^o F at: **http://photovoltaics.sandia.gov/weather/Weather.htm**.

3. Acclimatization.

3.1. Acclimatization is a series of physiological adjustments, which occur when an individual is exposed to a hot or cold climate. A period of acclimatization is required for all personnel regardless of each individual's physical condition. The better the individual's physical condition, the quicker acclimatization is reached. Acclimatization is achieved through progressive degrees of heat exposure and physical exertion. Acclimatization to heat begins with the first exposure and is usually developed to about 50% by the end of the first week. Substantial acclimatization (about 78%) should occur by the end of the second week. Full acclimatization is attained quickest by gradually increasing period of work in the heat.

3.2. For personnel needing acclimatization (see paragraph 3.3.), supervisors should adjust work schedules. The most strenuous tasks should be performed early in the morning or late in the evening, with lighter duty tasks performed during the remainder of the duty day. As personnel become acclimatized, work schedules can be shifted back to normal routines. When un-acclimated personnel are exposed to heat, they may experience some discomfort and signs of heat strain, such as high body temperature, increased heart rate and fatigue on the first day. On each succeeding day, personnel's ability to perform at the same level of heat stress improves as signs of discomfort and strain diminish. During the two weeks it takes to acclimatize, personnel should be especially aware of the signs and symptoms of heat stress disorders and drink plenty of water. When discomfort and heat stress symptoms occur, personnel should self-pace their activities to perform below maximum physical capacity by

adjusting their work speed and interspersing brief, unscheduled and in-place breaks. After a period of one to two weeks, personnel should be able to perform all tasks without difficulty.

3.3. The following applies to personnel who need acclimatization:

3.3.1. Individuals who are routinely and occupationally exposed to strenuous duties or heavy work need acclimatization each year. This may occur during regular duty or work as outside temperatures increase during the spring and summer.

3.3.2. Newly assigned personnel arriving from cooler climates should follow the acclimatization guidelines given above.

3.3.3. Personnel returning to work after four days of illness should undergo a four-day re-acclimatization.

3.3.4. Personnel returning to work after nine or more days away from work should undergo a four-day re-acclimatization.

ROBERT L. MANESS, Colonel, USAF
Commander, 377 Air Base Wing

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

American Conference of Governmental Industrial Hygienists, Threshold Limit Values, 2008

AFMAN 10-100, *Airman's Manual,* 1 March 2009

AFMAN 33-363, *Management of Records,* 1 March 2008

AFI 36-2905, *Fitness Program,* 1 July 2010

AFP 48-151, *Thermal Injury,* 18 November 2002

AFPD 48-1, *Aerospace Medical Program,* 3 October 2005

Adopted Forms

AF Form 847, Recommendation for Change of Publication

Abbreviations and Acronyms

377ABW/CP—377 Air Base Wing Public Affairs

377ABW/PA—377 Air Base Wing Command Post

377AMDS/SGPM—377 Medical Group Public Health

377AMDS/SGPB—377 Medical Group Bioenvironmental Engineering

AF—Air Force

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFPAM—Air Force Pamphlet

AFRC—Air Force Reserve Command

AFRIMS—Air Force Records Information Management System

ANG—Air National Guard

BEE—Bioenvironmental Engineering

KAFB—Kirtland Air Force Base

MOPP—Mission Oriented Protective Posture

OPR—Office of Primary Responsibility

PT—Physical Training

RDS—Records Disposition Schedule

WBGT—Wet Bulb Globe Temperature

Terms

Acclimatization—A series of physiological adjustments, which occur when an individual is exposed to a hot or cold climate. In simple terms, this is considered a break-in period to help personnel slowly adjust to hot and cold environments.

Heat Stress—The net heat load to which a worker may be exposed from the combined contributions of metabolic cost of work, environmental factors (air temperature, humidity, air movement, etc.) and clothing. In simple terms, heat stress is the body burden from these three categories above.

Thermal Stress—The common term used to cover both heat and cold stress.

Work/Rest Cycle—A guidance schedule for personnel to ensure adequate rest breaks are taken to avoid heat stress disorders.

Attachment 2

FLAG CONDITIONS

Table A2.1. Flag Conditions No Flag is required for Heat Category 1

Heat Cat/Flag Color	WBGT (F)	Easy Work		Moderate Work		Hard Work	
		Work Rest Cycle	Water Intake Qt/hr(1)	Work Rest Cycle(2,3)	Water Intake Qt/hr	Work Rest Cycle	Water Intake Qt/hr
1	78-81.9	No Limit	0.5	No Limit	0.75	40/20 min	0.75
2	82-84.9	No Limit	0.5	50/10 min	0.75	30/30 min	1.0
3	85-87.9	No Limit	0.75	40/20 min	0.75	30/30 min	1.0
4	88-89.9	No Limit	0.75	30/30 min	0.75	20/40 min	1.0
5	>90	50/10 min	1.0	20/40 min	1.0	10/50 min	1.0

Notes:

1. For all three work rates, individual water requirements may vary by ± 0.25 qt/hr.

2. When performing work/exercise with ground crew ensemble, fire-fighting gear, Mission Oriented Protective Posture(MOPP) Level 4 or other similar restrictive or impermeable clothing arrangements should be made for remote site measurement of the WBGT and 10°F added to the measurement. Add 15°F WBGT if also wearing combat armor; if combat armor is worn alone in humid climates add only 5°F WBGT.

3. Rest means minimal physical activity (i.e., sitting or standing, accomplished in the shade if possible)

4. In accordance with AFI 36-2905, when the heat index is above 85°F, PT testing shall not be conducted.

Attachment 3

WORK AND REST CYCLES FOR OCCUPATIONAL HEAT EXPOSURES

Table A3.1. Work Rest Cycle Table (Values given in degrees F WBGT)

Work/Rest Regimen (per hour)	WORKLOAD		
	Light	Moderate	Heavy
Continuous Work	86	80	77
75% Work/25% Rest	87	82	78
50% Work/50% Rest	89	85	82
25% Work/75% Rest	90	88	86

A3.1. Permissible Heat Exposure Limits. The permissible heat exposure limits are extracted from the American Conference of Governmental Industrial Hygienists Threshold Limit Value booklet. The limits in the table below are based on the following assumptions.

A3.1.1. Personnel are assumed to be acclimated, fully clothed, with average water and salt intake.

A3.1.2. Personnel can take breaks to prevent becoming overheated.

A3.1.3. Exposure limits are based on personnel working in normal work clothing.

A3.1.3.1. Continuous Work = No work restrictions.

A3.1.3.2. 25% rest = 15 minute rest each hour.

A3.1.3.3. 50% rest = 30 minute rest each hour.

A3.1.3.4. 75% rest = 45 minute rest each hour

Table A3.2. Work Level Examples

Light	Sitting with moderate arm and leg movement Standing with light work at machine or bench while using mostly arms Using a table saw Standing with light or moderate work at machine or bench and some walking about
Moderate	Walking about with moderate lifting or pushing Scrubbing in a standing position Walking on level at 6Km/hr. while carrying 3Kg weight load
Heavy	Shoveling dry sand Carpenter sawing by hand Heavy assembly work on a non-continuous basis Intermittent heavy lifting with pushing or pulling (pick and shovel work)
Very Heavy	Shoveling wet sand

A3.2. Personal Protective Equipment Adjustment: Personnel required to wear heavy personal protective equipment (e.g., disposable coveralls, respiratory protection, etc.) during normal work center processes have an increase potential for heat stress. Supervisors of personnel who require heavy personal protective equipment should contact 377 AMDS/SGPB, 6-4259, to identify the appropriate correction factors to Table 2.

A3.3. Prevention of Heat Stress Disorders:

A3.3.1. Education. Personnel working and/or training in hot environments must be educated on the causes, symptoms, first-aid treatments and prevention of heat disorders. Personnel must also be educated on the following factors, which may contribute to heat injury.

A3.3.2. Water. Drink large quantities of cool water to make up for water lost through sweating. It is better to drink small amounts of water frequently (a pint every 20 minutes) to replace water than to drink large amounts less frequently. Milk and coffee do not make up for water loss. Carbonated beverages, while containing water, are not as effective as water in keeping the body hydrated because of the tendency to delay gastric emptying.

A3.3.3. Salt. Some salt is lost in the sweat. Because the typical North American diet contains so much salt, an individual should season food to taste, but should not make any additional attempts to add excessive salt to the diet. Salt tablets must not be used except under special operating environments when ordered by competent medical authority.

A3.3.4. Clothing. Wear loose fitting clothing, especially at the neck and wrist, to allow air circulation. Wear appropriate headgear. When exposed to the Sun's rays, cover yourself and apply a sun-blocking lotion to prevent sunburn. When not exposed to the sun, consideration should be given to wearing the least allowable amount of clothing.

A3.3.5. Acclimatization. Personnel must be acclimated to heat exposures. See paragraph 3.

A3.3.6. Work Schedules. Modify work schedules to perform the heaviest work in the coolest parts of the day. When working in hot environments, establish work and rest cycles as outlined in Table 2. Take rest breaks in cool, shaded areas.

A3.3.7. Food. Avoid eating greasy, fatty or heavy foods.

Attachment 4

HEAT STRESS DISORDERS

Table A4.1. Heat Stress Disorders

INJURY	SYMPTOMS	FIRST AID
Heat Syncope	Fainting when standing erect and immobile in the heat	Remove to cool area. Allow to recline and provide cool water. Recovery will be prompt and complete.
Heat Cramps	Active sweating, muscle cramps. Spasms, usually in the muscles of arms.	Remove to cool area. Massage extremities. Contact medical facility.
Heat Exhaustion	Profuse sweating or moist, cool skin. Cramps in abdomen or limbs. Pale face. Dizziness, faintness, weakness, nausea or vomiting. Weak pulse. Normal body temperature.	Treat for shock. Lay person down in cool area and elevate feet. Loosen clothing and cool body by sprinkling with cool water or fanning (not to the point of shivering). Give cool water to drink if conscious. Contact medical facility.
Heat Stroke – MEDICAL EMERGENCY	Red face, skin. Strong, rapid pulse Wet or dry skin (sweating most likely in younger individuals).	THIS IS A MEDICAL EMERGENCY. CALL 911. Treat for shock. Lay person down in cool area and elevate feet. Loosen clothing and cool body by sprinkling with cool water or fanning (not to the point of shivering). Give cool water to drink if conscious – add two teaspoons of salt to one canteen if available.